

REMARKS

The Office Action mailed March 10, 2006, has been received and reviewed. Claims 1-67 are currently pending in the application. Claims 10-28 and 45-67 stand rejected. Claims 1-9 and claims 29-44 are withdrawn as being drawn to a nonelected invention/species and have been canceled without prejudice or disclaimer to the filing of one or more divisional applications including the subject matter thereof. Applicants have amended claims 10-19, 21-28, 45-53, 55, and 57-63, canceled claims 20 and 56, and respectfully request reconsideration of the application as amended herein.

Independent claims 10 and 45 have been amended to recite that each of the metal layer, the oxide layer, the nitride layer, and the polyimide layer is an exposed layer. Support for these amendments is found in the as-filed specification at at least FIGs. 1-12. Independent claims 18 and 55 have been amended to recite that each of the metal layer, the oxide layer, and the nitride layer is an exposed layer. Support for these amendments is found in the as-filed specification at at least FIGs. 1-12. Claim 18 has been amended to recite that a silicon substrate having a HAZ is provided. Support for this amendment is found in the as-filed specification at at least paragraph [0030].

Claims 11-17, 19, 22-28, 46-53, and 57-63 have been amended to improve antecedent basis.

Specification

The Examiner has objected to the title of the invention. Applicants have amended the title to be indicative of the invention to which the claims are directed.

35 U.S.C. § 102 Anticipation Rejections

Anticipation Rejection Based on U.S. Patent Publication No. 2003/0073299 to Mashino

Claims 18, 19, 55, 64 and 67 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Publication No. 2003/0073299 to Mashino ("Mashino"). Applicants respectfully traverse this rejection, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found,

either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989).

Mashino discloses a method of forming a hole in a silicon substrate. Mashino at paragraph [0002]. A conductor pattern on the silicon substrate is covered with a protective film. *Id.* at paragraph [0034]. Both sides of the silicon substrate are then covered with a nickel plating film, which also covers the protective film. *Id.* at paragraph [0035]. The hole is formed in the silicon substrate by laser ablation. *Id.* at paragraph [0037]. During the laser ablation, silicon is deposited around the periphery of the hole and on sidewalls of the hole. *Id.* at paragraphs [0037] and [0039]. The silicon deposited around the periphery of the hole is removed using a nickel peeling solution. *Id.* at paragraph [0040]. The silicon deposited on the sidewalls of the hole is removed using a potassium hydroxide solution. *Id.* at paragraph [0041].

Mashino does not expressly or inherently describe each and every element of claim 18 because Mashino does not disclose the element of “removing the HAZ without removing at least one of an exposed metal layer, an exposed oxide layer, and an exposed nitride layer present on the silicon substrate by exposing the silicon substrate to an etch solution comprising tetramethylammonium hydroxide (“TMAH”) and at least one organic solvent.” Mashino does not disclose this element because Mashino discloses using a nickel peeling solution or a potassium hydroxide solution to remove silicon.

Claim 19 is allowable, *inter alia*, as depending from an allowable base claim.

Since independent claim 55 recites a limitation that is substantially the same as the above-mentioned limitation of claim 18, Mashino does not expressly or inherently describe each and every element of claim 55 for substantially the same reasons discussed above.

Claims 64 and 67 are allowable, *inter alia*, as depending from an allowable base claim.

Anticipation Rejection Based on U.S. Patent No. 6,927,146 to Brask *et al.*

Claims 10-13 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,927,146 to Brask *et al.* (“Brask”). Applicants respectfully traverse this rejection, as

hereinafter set forth.

Brask discloses a method of chemically thinning a silicon body of a silicon-on-insulator (“SOI”) structure. Brask at column 1, lines 7-10. The SOI structure includes the silicon body, a buried oxide, and a handle wafer. *Id.* at column 2 line 49 through column 3, line 7. A thickness of the silicon body is reduced to form a fully-depleted SOI structure. *Id.* at column 4, lines 49-53. The thickness of the silicon body is reduced by exposing the SOI structure to a solution of TMAH in methanol or isopropanol. *Id.* at column 6, lines 14-53.

Brask does not expressly or inherently describe each and every element of claim 10 because Brask does not disclose the element of “removing the silicon layer without removing at least one of an exposed metal layer, an exposed oxide layer, an exposed nitride layer, and an exposed polyimide layer also present on the semiconductor substrate.” While Brask discloses reducing the thickness of the silicon body, the SOI structure of Brask does not include at least one of an exposed metal layer, an exposed oxide layer, an exposed nitride layer, and an exposed polyimide layer. Since the buried oxide and the handle wafer of the SOI structure remain covered by the silicon body, neither of these layers is properly considered to be an exposed metal layer, an exposed oxide layer, an exposed nitride layer, or an exposed polyimide layer. As such, Brask does not disclose removing a silicon layer without removing one of the recited, exposed layers.

Claims 12 and 13 are allowable, *inter alia*, as depending from an allowable base claim.

Anticipation Rejection Based on U.S. Patent Publication No. 2005/0077913 to Watkins *et al.*

Claims 10-14, 18-25, 45-49, and 54 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Publication No. 2005/0077913 to Watkins *et al.* (“Watkins”). Applicants respectfully traverse this rejection, as hereinafter set forth.

Watkins discloses a method of fabricating a compliant contact structure. Watkins at paragraph [0023]. The compliant contact structure is fabricated by forming a contact slot in a substrate. *Id.* at paragraph [0025]. The contact slot is formed by laser ablation of the substrate. *Id.* A solution of tetramethylammonium hydroxide (“TMAH”) or TMAH and propylene glycol is used to clean the contact slot. *Id.* at paragraph [0028]. After cleaning, an insulative layer is

formed on sidewalls of the contact slot. *Id.* at paragraph [0030]. A seed layer is formed over the insulative layer and a conductive layer is formed over the seed layer. *Id.* at paragraphs [0031] and [0034]. A contact bulk pit is formed in the substrate by chemical etching, mechanical etching, or laser ablation. *Id.* at paragraph [0036]. Additional portions of the substrate, contact sidewalls, and insulative layer are removed using a solution of TMAH and glycol. *Id.* at paragraph [0037].

Watkins does not expressly or inherently describe each and every element of claim 10 because Watkins does not disclose the element of “removing the silicon layer without removing at least one of an exposed metal layer, an exposed oxide layer, an exposed nitride layer, and an exposed polyimide layer also present on the semiconductor substrate.” Watkins does not disclose this element because when the solution of TMAH and propylene glycol is used to clean the contact slot, no additional layers are present on the substrate. See FIG. 2A of Watkins. As clearly shown in FIG. 2A, only the contact slot and the substrate are present at this stage of the fabrication of the compliant contact structure. Therefore, Watkins does not disclose removing a silicon layer without removing at least one of an exposed metal layer, an exposed oxide layer, an exposed nitride layer, and an exposed polyimide layer. In addition, when the solution of TMAH and glycol is used, this solution removes portions of the substrate, contact sidewalls, and insulative layer. Since portions of the contact sidewalls and insulative layer are removed, Watkins does not disclose removing the silicon layer without removing at least one of an exposed metal layer, an exposed oxide layer, an exposed nitride layer, and an exposed polyimide layer.

Claims 11-14 are allowable, *inter alia*, as depending from an allowable base claim.

Watkins also does not expressly or inherently describe each and every element of claim 18 because Watkins does not disclose “removing the HAZ without removing at least one of an exposed metal layer, an exposed oxide layer, and an exposed nitride layer present on the silicon substrate.” Since the HAZ in Watkins is removed before additional layers are formed on the substrate, Watkins necessarily does not disclose removing the silicon layer without removing at least one of the recited exposed layers.

Claims 19-25 are allowable, *inter alia*, as depending from an allowable base claim.

Watkins also does not expressly or inherently describe each and every element of claim 45 because Watkins does not disclose the element of “removing the HAZ without removing at least one of an exposed metal layer, an exposed oxide layer, an exposed nitride layer, and an exposed polyimide layer present on the silicon substrate.” Watkins does not disclose this element for substantially the same reasons as discussed above for claim 10.

Claims 46-49 and 54 are allowable, *inter alia*, as depending from an allowable base claim.

Anticipation Rejection Based on U.S. Patent Publication No. 2004/0256734 to Farnworth *et al.*

Claims 18, 19, 55, 64, and 67 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Publication No. 2004/0256734 to Farnworth *et al.* (“Farnworth”). Applicants respectfully traverse this rejection, as hereinafter set forth.

Farnworth discloses a method of fabricating a semiconductor component. Farnworth at paragraph [0006]. The semiconductor component includes a base die and a secondary die that are stacked and bonded to each other. *Id.* at paragraph [0051]. The base die includes a plurality of integrated circuits, a passivation layer, redistribution conductors, under bump metallization layers, redistribution insulating layers, a polymer layer, and vias. *Id.* at paragraphs [0076]-[0086]. The vias are formed by laser ablation. *Id.* at paragraph [0087]. TMAH is used to clean the vias and to thin the silicon substrate. *Id.* at paragraph [0090]. A protective tape is formed over the polymer layer to protect the integrated circuits on the base die during subsequent fabrication. *Id.* at paragraph [0085]. The protective tape is formed from a polyimide material. *Id.*

Farnworth does not expressly or inherently describe each and every element of claim 18 because Farnworth does not disclose “removing the HAZ without removing at least one of an exposed metal layer, an exposed oxide layer, and an exposed nitride layer present on the silicon substrate.” Since a protective tape is formed over the integrated circuits, the semiconductor component of Farnworth does not include an exposed metal layer, an exposed oxide layer, or an exposed nitride layer.

Claim 19 is allowable, *inter alia*, as depending from an allowable base claim.

Farnworth does not expressly or inherently describe each and every element of claim 55 because Farnworth does not disclose the element of “removing the HAZ without removing at least one of an exposed metal layer, an exposed oxide layer, and an exposed nitride layer present on the silicon substrate.” Since this element is identical to that recited in claim 18, claim 55 is allowable for substantially the same reasons as discussed above for claim 18.

Claims 64 and 67 are allowable, *inter alia*, as depending from an allowable base claim.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on Brask in view of Sachem Spec Sheet 379

Dependent claims 14-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Brask in view of Sachem Spec Sheet 379 (“Sachem”). Applicants respectfully traverse this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for an obviousness rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant’s disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

The 35 U.S.C. § 103(a) obviousness rejection of claims 14-17 is improper because the cited references do not provide a motivation to combine to produce the claimed invention.

Since each of claims 14-17 is a dependent claim, each claim includes all of the limitations of independent claim 10. Claims 14-17 are allowable, *inter alia*, as depending from claim 10, which is allowable over Brask for the reasons previously discussed. Claim 10 is allowable over the combination of Brask and Sachem because Sachem does not cure the deficiencies in Brask.

Claims 14-17 are also allowable because there is no motivation to combine the cited references. To provide a motivation or suggestion to combine, the prior art or the knowledge of a

person of ordinary skill in the art must “suggest the desirability of the combination” or provide “an objective reason to combine the teachings of the references.” M.P.E.P. § 2143.01. “The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.” *Id.* (emphasis in original).

The Examiner states that it would be obvious to a person of ordinary skill in the art to “use the claimed etch solution as taught by Sachem in the process of Brask et al as a known etchant for removing silicon.” Office Action of March 10, 2006, p. 9. However, this statement does not provide the requisite motivation to combine because it is conclusory and is not based on objective evidence of record. Nothing in Brask and Sachem, when combined, suggests the desirability of, or provides an objective reason for, combination. Specifically, nothing in Brask provides any suggestion or objective reason to use a solution of TMAH and propylene glycol to remove silicon. As such, Brask necessarily does not provide a suggestion or objective reason to use a solution of 6% TMAH and 94% propylene glycol. Sachem also does not provide a suggestion or objective reason to use a solution of TMAH and propylene glycol to remove silicon because its teachings are limited to providing specific details of the TMAH/propylene glycol solution.

Applicants, therefore, respectfully request reconsideration and allowance of claims 14-17.

Obviousness Rejection Based on Watkins in view of Sachem

Claims 15-17, 26-28, 50-52, and 61-63 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Watkins in view of Sachem. Since each of these claims is a dependent claim, each claim includes all of the limitations of the independent claim from which it depends.

As such, claims 15-17 are allowable, *inter alia*, as depending from allowable claim 10, which is allowable over Watkins for the reasons previously discussed. Claim 10 is allowable over Sachem because Sachem does not cure the deficiencies in Watkins.

Claims 26-28 are allowable, *inter alia*, as depending from allowable claim 18, which is allowable over Watkins for the reasons previously discussed. Claim 18 is allowable over the combination of Watkins and Sachem because Sachem does not cure the deficiencies in Watkins.

Claims 50-52 are allowable, *inter alia*, as depending from allowable claim 45, which is allowable over Watkins for the reasons previously discussed. Claim 45 is allowable over the combination of Watkins and Sachem because Sachem does not cure the deficiencies in Watkins.

Claims 61-63 are allowable, *inter alia*, as depending from allowable claim 55, which is allowable over Watkins for the reasons previously discussed. Claim 55 is allowable over the combination of Watkins and Sachem because Sachem does not cure the deficiencies in Watkins.

Applicants, therefore, respectfully request reconsideration and allowance of claims 15-17, 26-28, 50-52, and 61-63.

Obviousness Rejection Based on Farnworth or Mashino in view of Sachem

Claims 10-17, 20-28, 45-54, and 56-63 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Farnworth or Mashino in view of Sachem. Claims 20 and 56 have been canceled, rendering moot the rejection as to these claims. Applicants respectfully traverse the rejection as to the remaining claims, as hereinafter set forth.

Each of independent claims 10 and 45 are allowable because Farnworth or Mashino in view of Sachem do not teach or suggest the limitation of “removing the silicon layer without removing at least one of an exposed metal layer, an exposed oxide layer, an exposed nitride layer, and an exposed polyimide layer also present on the semiconductor substrate.” Each of Farnworth and Mashino does not teach or suggest this limitation for the reasons discussed above in the respective anticipation rejections. Sachem also does not teach or suggest this limitation because its teachings are limited to providing specific details of the TMAH/propylene glycol solution.

Claims 11-17 are allowable, *inter alia*, as depending from allowable claim 10.

Claims 46-54 are allowable, *inter alia*, as depending from allowable claim 45.

Dependent claims 21-28 are allowable, *inter alia*, as depending from allowable claim 18.

Dependent claims 57-63 are allowable, *inter alia*, as depending from allowable claim 55.

Obviousness Rejection Based on Farnworth, Watkins, or Mashino in view of Japanese Patent No. 06-041770 to Takehiko *et al.*

Claims 65 and 66 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over

Farnworth, Watkins, or Mashino in view of Japanese Patent No. 06-041770 to Takehiko *et al.* (“Takehiko”). Applicants respectfully traverse this rejection, as hereinafter set forth.

Claims 65 and 66 are allowable, *inter alia*, as depending from an allowable base claim, namely claim 55, which is allowable over each of Farnworth, Watkins and Mashino. The proposed combination of any of such references with Takehiko fails to cure the deficiencies of the individually cited references.

Applicants, therefore, respectfully request reconsideration and allowance of claims 65 and 66.

ENTRY OF AMENDMENTS

The amendments to claims 10-19, 21-28, 45-53, 55, and 57-63 should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add new matter to the application.

CONCLUSION

Claims 10-19, 21-28, 45-55, and 57-67 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Bradley B. Jensen", followed by a long horizontal line.

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